

[0049] Once plate 14 has been made, one electronic module 2, which is electrically independent of the plate, is inserted into each aperture 16. The electronic module and all the electrical connections thereof, are made beforehand. In the example described here, module 2 includes a substrate 12, which extends into at least some zones at the edge of said module, beyond the electronic elements 4 to 8 which said module carries. The dimensions and shape of substrate 12 are such that it has two zones 24 which are superposed on the two projecting portions 18, when electronic module 2 is inserted into aperture 16. Thus, substrate 12 abuts against projecting portions 18, as shown in FIG. 3B.

[0050] According to the invention, electronic modules 2 are assembled to plate 14 in a sufficiently rigid manner, firstly, so that electronic modules 2 remain in apertures 16 during the card manufacturing method according to the invention, and secondly, so that they approximately maintain the initial position defined when projecting portions 18 are assembled. The electronic module can be positioned when it is inserted into aperture 16 relative to a defined reference on plate 14. This positioning of module 2 relative to plate 14 may concern the module as a whole and thus in particular substrate 12, or it may concern one particular element of the module, in particular electronic display 6. This is particularly advantageous, given that display 6 is, by definition, meant to be visible on one surface of the finished card. Precise positioning of the display relative to the contour 20 of the card is important for aesthetic reasons, and also functional reasons, when the display appears through an aperture in a covering layer of the card. When positioning is required relative to the display, means are provided for marking electronic display 6 and then inserting module 2 in such a way that display 6 is in a determined position relative to plate 14, which thus forms a positioning structure.

[0051] Electronic module 2 can be secured to projecting portions 18 in various ways. By way of example, provided that the materials forming the two zones 24 of substrate 12 and projecting portions 18 can adhere directly to each other, said zones 24 are simply heat welded to projecting portions 18, using thermodes. Module 2 can also be secured to plate 14 using an ultrasound head or other means known to those skilled in the art. In another variant, an adhesive film is deposited, either on projecting portions 18, or on zones 24, so as to bond them to each other. In other variants, substrate 12 is secured to projecting portions by adding drops of adhesive or a strip of adhesive between the edge of the substrate and the projecting portions. Any chemical or physical means that assemble module 2 to the projecting portions in a sufficiently rigid manner can be used within the scope of the present invention.

[0052] A secure assembly is thus obtained, formed of plate 14 and electronic modules 2, which are housed in apertures 16 of the plate. Two particular, advantageous features of assembly 22 will be noted:

[0053] firstly, the thickness of module 2 is substantially identical to the thickness of plate 14, electronic module 2 being entirely housed in the corresponding aperture 16;

[0054] secondly, a slot 26 remains between module 2 and the edge of aperture 16, with the exception of the zones where projecting portions 18 are located.

[0055] The fact that module 2 is housed entirely inside aperture 16, i.e. in the thickness of plate 14, means that the manufacture of relatively thin cards can be better controlled.

This means cards that have the smallest possible increase in thickness relative to the thickness of module 2. The presence of a slot 26 reduces manufacturing tolerances for pierced plate 14 and modules 2 and also allows substrate 12 to be positioned slightly differently from one aperture to another, depending upon the position of the electronic display assembled to the substrate. Moreover, as will become clear below, slots 26 can then be filled by a resin, which thus provides an adherent bridge between substrate 12 and the wall of through aperture 16. This ensures, finally, that electronic module 2 and plate 14 are perfectly secured to each other, such that, when the finished card is bent or subjected to other stress, electronic module 2 follows the deformation of plate 14 properly. This prevents the edges of substrate 12 of module 2 marking the external surfaces of the finished card and thus damaging the aesthetic appearance of the card. It will be noted that the material used, in particular for making substrate 12, is selected so that it can withstand a certain amount of elastic deformation and can allow electronic module 2 to be bent, when the card is subjected to stress, particularly within the scope of tests carried out to ensure compliance with the relevant standards.

[0056] A first alternative embodiment is shown in FIG. 5, which shows a single aperture 16 of a plate 14, which here has approximately the dimensions of a single card. This simplified diagram, which is also used in FIGS. 6 and 8, is in no way restrictive, and describes an assembly 30, which is similar to assembly 22 of FIG. 4, i.e. for batch manufacturing a plurality of cards.

[0057] The variant of FIG. 5 differs in that the projecting portions 18A are formed in the four corners of aperture 16. The portions thus define truncated corners in the bottom area of aperture 16. Projecting portions 18A, which project relative to the generally rectangular shape of aperture 16, can be made by the same, aforementioned techniques. The dimensions of module 2 are such that the four corners of substrate 12 are superposed on the four parts 18A. The electronic module is assembled to plate 14 in a similar manner to the previously described variant.

[0058] FIG. 6 shows a second alternative embodiment of the assembly according to the invention. This alternative is characterized in that it provides a step 34, which forms an intermediate level against which two lateral zones 36 of substrate 12 abut, along two opposite edges of rectangular aperture 16. Steps 34 can be formed in a similar manner to the projecting portions described in the other variants. The electronic module is assembled to plate 14 by welding or bonding, or by any other physical or chemical means available to those skilled in the art.

[0059] FIGS. 7A and 7B show an assembly according to a third variant of the first embodiment. Frame 14 includes a plurality of apertures 16. The peripheral area of each aperture has at least one notch 38 or preferably at least two notches 38. Each notch defines a small circular step. Electronic module 2 has projecting portions 40 at the edge thereof, which are partially superposed on notches 38 when module 2 is inserted in aperture 16. These projecting portions 40 rest on the small circular steps 38. Module 2 is assembled to plate 14 via zones 40, which are either welded, or bonded in notches 38. In a particular variant, the notches are sized such that projecting zones 40 have to be forcibly pushed into these notches, which secures electronic module 2 to plate 14. However, this latter variant has the drawback of requiring substrate 12 and notches 38 to be machined very precisely in the peripheral